

**Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.**

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**The Azores- A lot of ocean backyard**



*Sete Cidades, on the Azorean island of Sao Miguel, is a huge volcanic crater now filled with two lakes, one blue and one green.*



*The southwest coast of Sao Miguel-5500 miles away is Santa Cruz.*

*Photos by Gary Griggs*

Seventeen whaling stations operated intermittently along the California coast between about 1850 and 1880, stretching from Crescent City to San Diego including several in Monterey Bay. The great majority of the whalers were from the Azores. For many Azorean men, signing onto a whaling ship was a ticket off the islands where economic opportunities were very limited.

I'm writing from the island of São Miguel, one of 9 islands making up the Azorean archipelago scattered across nearly 300 miles of Atlantic Ocean. The Azores are an autonomous region of Portugal and are a long way from anywhere. We are about 850 miles west of Portugal, 2400 miles east of Boston and at the latitude of San Francisco.

The islands are all volcanic in origin and first emerged from the sea about four million years ago. The Azores are in the midst of a tectonic junction where three different plates (the North American, European and African plates) come together, sometimes called a triple junction.

These islands are usually labeled as one of the planet's hotspots, locations where hot thermal plumes emerge at the surface from deep within the Earth's mantle. There are about 40 hotspots scattered across the Earth's surface, Hawaii, Yellowstone, and Iceland being several well known examples.

There doesn't appear to be complete geologic agreement on the origin of these volcanic islands, however. Rather than being a result of a hotspot, some believe that this volcanic archipelago is due to volcanism related to spreading along an ocean ridge that extends east from the Mid-Atlantic Ridge.

This all matters little to the Azoreans, who have had to contend with intermittent volcanic eruptions and their associated earthquakes since they first occupied the islands about 500 years ago. Over the past 3000 or so years, major eruptions have occurred on average about every 360 years.

The first reported destructive earthquake took place on October 22<sup>nd</sup>, 1522. Vila Franca do Campo on São Miguel, the capital of the Azores at that time, was completely destroyed and more than 5,000 people died, many of which buried by major debris flows triggered by the earthquake.

A major 13-month long eruption of Capelinhos on the island of Faial that began in 1957 led to the immigration of more than 4000 residents to the United States. A number of those volcanic survivors became our neighbors, with many settling in Watsonville.

I realized after planning our trip that more recent volcanic unrest occurred in 2005 on São Miguel, where we are staying. Magma rose to shallow reservoirs beneath the center of the island, leading to intense seismic activity, surface ruptures and triggering over 250 landslides.

It's good to know that an eruption might occur beneath your feet at almost any time; but then anyone living in the shadows of the Cascades, stretching from Mt. Lassen to Mount Rainer lives with nearly the same geologic uncertainty. But in contrast to large earthquakes, there are usually precursors prior to volcanic eruptions so they don't come as a complete surprise.

It's a remarkable and beautiful island, all volcanic and all very, very green from the combination of fertile volcanic soils and regular rainfall. There are a number of picturesque lakes filling ancient calderas, as well as boiling hot springs and bubbling mud pots.

Dairy cows seem to occupy most of the hilly landscape, kept in by old stonewalls, and looking very content. Road cuts and coastal cliffs reveal the evidence of the island's eruptive history with ancient lava flows and layered volcanic ash deposits. Most of São Miguel's coastline is very steep and rugged. The few beaches all consist of black sand from the weathering and breakdown of the island's basaltic foundation.

The Azoreans take remarkable care of São Miguel; trash seems to be almost non-existent, roads are well maintained and are lined by pink azaleas and in another month, millions of blue hydrangeas. Roadside vegetation everywhere is constantly trimmed and pruned. People are friendly, and food is good and inexpensive. From the perspective of a week, it seems pretty close to paradise.